

Coffee Creek Ecoresort Community: Gateway to the Indiana Dunes

An Honors Thesis (LA 404)

by

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The main focus of the project is the implementation of ecotourism at Coffee Creek in Chesterton, Indiana. The educational focus of the ecotourism will be sustainable stormwater management. Coffee Creek was originally envisioned as a new urbanism community centering on the rehabilitation of the creek and sustainable stormwater management. However, following the consequences of illegal practices by Lake Erie Land Company, the developers of the site, little has actually been developed. Ten years after opening to the public, sparse development and the Coffee Creek Watershed Preserve remain. The watershed preserve is the only truly successful attraction from the original design.

The study revealed the potential for the development of an ecotourism destination on site. Chesterton, to many, is the gateway community to the Indiana Dunes. Establishing an ecoresort community at Coffee Creek provides Dunes visitors not only a nearby place to stay but adds to their visit experience as a whole. The ecoresort educates about sustainability and conservation, with a focus on sustainable stormwater management. Artful stormwater design is used to literally immerse the visitors and residents in the process of sustainable stormwater management systems, educating them and raising their awareness.

I would like to thank my Studio professors, John Motlock, Chris Marlow and Burcu Turan, for their guidance through this whole process. Their patience and knowledge will always be greatly appreciated. I would also like to thank Les Smith, my advisor, for giving me new ideas and pushing my design to the next level. Lastly, I would like to thank my parents for all their time they spent listening to me incessantly talk and worry about this project.

This project involved redeveloping Coffee Creek Center in Chesterton, Indiana. Coffee Creek Center was originally designed as innovative new urbanism planned community. It was to be an example to planners, landscape architects, and architects. The community used low impact design and focused on the revival and rehabilitation of Coffee Creek, calling for a watershed preserve to be developed to protect the stream and its habitat from future development. The center of the community was in fact the Coffee Creek Watershed Preserve. Due to monetary issues and illegal bribery, however, the complete project was never realized. Today the site consists only of the watershed preserve, scattered commercial development, sparse residential development, and roads leading to nowhere.

As a resident of Chesterton, I witnessed this process from beginning to present. The site has always remained unfinished to me, in spite of the watershed preserve being successful as a place for passive recreation, nature education, community gatherings and even wedding ceremonies. Chesterton is also increasingly viewed as the gateway community to the Indiana Dunes. This being said, I envisioned the future of Coffee Creek as an ecoresort community to “finish” the site. Research revealed many supports for this type of development. My design focuses on educating visitors and residents about sustainable stormwater management practices, which I achieved through ecotourism and artful rainwater design (ARD). My ecotourism component teaches about conservation and respect for the natural environment, whereas both sites have had a history environmental neglect and harm, especially when looking at water resources. Artful rainwater design makes natural stormwater cleansing

systems visible and interactive, often using signage as an additional educational supplement. ARD elements are seen at every level of design. Because ecotourism and sustainable stormwater management focus on making minimal environmental impacts and working with nature, not against it, the design looked at existing natural systems of the site and how they could be taken advantage of in its development.

The project gave me the opportunity to explore community planning and stormwater management and to discover the relationship between them. The original Coffee Creek Center master plan is known throughout the landscape architecture community. Students across the country have learned about this innovative community as it set standards for future new urbanism communities. However, even to this day, most still think the design is relevant and actually complete. I felt it important to bring attention to the facts and its failure. Regardless of the illegal actions that halted construction, the development was a failure from the start. It missed its target audience and the residents of Chesterton itself weren't thrilled about it to begin with because it seemingly ignored them and their needs/ interests altogether. The design itself works within the site boundaries, its bubble, but outside of the site boundaries, the design fails, ignoring its surroundings and outside connections.

The design dissolved these disparate elements, pleasing residents and visitors alike. It has something to offer to everyone. It created a landmark for Chesterton and cemented its place as the Gateway to the Indiana Dunes.



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"...beautiful and important Dunes, prairies and wetlands remain outside the parks, undefended. But even putting land into parks is not the final answer. New threats to the Dune's ecosystem are always emerging...among them the often invisible villains of air and water pollution, toxic waste, landfills, and the filling and draining of wetlands."

-Save the Dunes

review of literature



“The ecology of Northwest Indiana has long been one of the region’s richest and at times most underrated asset.” (Lake Erie Land Company) The unique environmental composition of the area has inspired modern environmental movements. Henry Chandler Cowles and Alice Gray, University of Chicago graduates, cared particularly for the Dunes. Cowles called the Indiana Dunes, “a floral melting pot of significant national merit.” Gray quickly developed a myth-like aura around herself, becoming known as the legendary “Diana of the Dunes”. She was a crusader for the Dunes whose insight was the basis of the Dunes early preservation. Coffee Creek is a small piece of the ecological puzzle of the area first recognized for its value by Cowles and Gray.

Coffee Creek was previously envisioned as a new urbanism community in Chesterton, Indiana. It failed. The company in charge of its development got involved in illegal practices, causing the halt of construction and the foreclosing of the company. One good thing did come from all of this, however--- the development of the Coffee Creek Watershed Preserve. The Preserve draws in people daily, in all seasons, with opportunities to expand. Coffee Creek is located in the town of Chesterton, Indiana, which for many is the gateway community to the Indiana Dunes State Park situated on nearby Lake Michigan. Therefore, Coffee Creek has potential to be an environmental education asset to the community. Additionally, the Dunes itself has had a relatively long history with conservation. “Save the Dunes” is one of Indiana’s oldest environmental groups, providing programs that focus on land, stewardship, water, and education. Finally, ecotourism not only helps establish Chesterton as the gateway to the Dunes, but it builds on the destination’s “sense of place”, informing both visitors

and residents about the surrounding environment and culture that is unique to the place.

The original master plan of Coffee Creek centered on the rehabilitation of the creek using environmental design and sustainable stormwater management. The redevelopment of Coffee Creek also focuses on sustainable stormwater management, integrating it into design and making it central to the educational aspect of the site. Coffee Creek eventually flows into Lake Michigan. This ecological and physical connection is expressed throughout Coffee Creek, stressing how sustainable stormwater management practices protect and enhance these two linked water systems. Ecotourism not only educates visitors and residents about the importance of the watershed preserve’s protection, but also about the nearby Dunes.

redevelopment opportunities

Chesterton, Indiana, is located five miles from the entrance to Indiana Dunes State Park. Commercial development along Highway 49 makes it one of the last stops annual visitors make before entering the State Park. According to Nevers, 1.08 million visitors passed through the gates in 2009, a 12 percent increase from 2008, making the Indiana Dunes State Park the second most visited state park in Indiana. In 2005, the state park was the seventh most visited. Park officials attribute this “re-discovery” of the park partly to the fall of the economy and partly to the increased media coverage. People are looking for inexpensive entertainment and are realizing what a jewel the Dunes are, a jewel in their own backyards. Additionally, improved facilities lead to improved visitation. The Nature Center, for example, had an 18.7% visitation increase and 60% of revenue from last year was from out-of-state visitors (Nevers). This data from visitor statistics provides support for the feasibility of a resort community located in Chesterton. This prime location makes it an excellent site to create a gateway/resort community. Such a community serves as a gateway to the Dunes and houses out-of-state and potential international visitors who make the trek to the Dunes each year. Chesterton itself already has commercial services, such as restaurants and hotels, which are suitable for such tourists. The resort is the final ingredient in establishing Chesterton as a gateway community. It takes advantage of and links to the nearby state park, informing visitors and locals on the natural and cultural heritage of the region (National Geographic). Coffee Creek teaches visitors their role in helping protect the fragile ecosystem, the Dunes, that they are about to visit. The likely increasing attendance will continue to support such a resort.

Why did Coffee Creek Community fail to begin with? Coffee Creek Center was designed by Lake Erie Land Company to be a 640-acre planned community that centered on the restoration and preservation of 180 acres surrounding Coffee Creek in Chesterton, Indiana (see figure 1.1). Stormwater and wastewater management were integrated into the design. Coffee Creek Center’s goal was to reintegrate people into their neighborhoods. Designers followed the phrase, “Live. Work. Play.” The Coffee Creek Center was to set the standards for land use sustainability, ecology, and quality of life (Coffee Creek Center). However, due to illegal bribes, the development of the area began to lull and the firm that planned the community foreclosed (see figure 1.2). The target market was completely missed as well -- the target client for the original master plan being urban residents, but inadvertently becoming suburban residents (Erler). The new urbanism concept is a tough sell in the Midwest to begin with, where most are still interested in having a big house on a big lot (Erler). Designers were recreating a small town, within a small town (Chesterton), located 50 miles from the major urban center of Chicago. However, for example, Samuel Staley, director of Urban and Land Use Policy at the Reason Public Policy Institute, questioned why people who want to live in a city would live an hour away from it. The target market for Coffee Creek Center was aimed at Chicago commuters from Indiana to the city, but Chicago itself already has a lot to offer city residents in its revitalized inner city. New urbanism seems to be more successful near deteriorated inner cities or greatly matured suburbs, both of which Chesterton is not, thus the proper market was not reached (Erler). However, the existing residents at Coffee Creek Center show that there is a market for this type



figure 1.1 - original Coffee Creek Center master plan



figure 1.2 - existing site

of development out there. Additionally, The Village in Burns Harbor, Indiana, a neighboring town to Chesterton, is built and designed in this type of new urbanism. It is the first nationally certified green neighborhood. It is smaller than Coffee Creek Center, covering only 60 acres. (The Village in Burns Harbor) It is not yet complete but its success so far further shows that there is a market for these types of communities in this region. Ecotourism, a topic to be discussed later, also attracts the market initially lost to Coffee Creek that is willing to sacrifice lot size for sustainability.

The town of Chesterton is currently undergoing an economic revitalization in general. Coffee Creek's redevelopment provides another great benefit to the town's economy. An example of how improved landscapes contribute to local economy is Estes Park, Colorado. Historically, Estes Park was the classic "trinket town" before entering a beautiful National Park. Also, the town had turned its back on the Fall River and Big Thompson River that ran through it. There were always traffic jams of people trying to enter the Rocky Mountain National Park and simply get through the town fast. Additionally, Estes Park was flood-prone due to the confluence of the two rivers and a poorly built and inspected dam of the reservoir upstream. What brought Estes Park back as a tourist attraction were landscape improvements. (Sorvig 34-35) Streetscape was the first to be improved. Next, the Estes Park Riverwalk was proposed and built. Today, the Riverwalk consists of several miles of trails, promenades, and places of public gathering, such as plazas. The design is built in local materials and echoes the "national park style" therefore honoring the Rocky Mountain National Park and

identifying the town as its gateway (Sorvig 38) (see figure 1.3). It created that “sense of place” that the town was originally lacking. These design elements and ideas are implemented into the redevelopment of Coffee Creek. The new Coffee Creek echoes the Dunes in its design details, sustainability practices and mission. Creating this identity for Coffee Creek in turn has changed Chesterton’s identity, helping establish it as a gateway community into Indiana Dunes State Park.

Sorvig also discusses Estes Park and how public landscapes increase economic value. Good landscape design can boost the health of the area’s population and increase value. More people are willing to go to attractive places (Sorvig 40). Not many landscape architects get the chance to prove this belief; however, Estes Park can do so with hard numbers. It had a 250 percent return on investment directly attributable to its landscape project. Estes Park continues its role as the entrance to Rocky Mountain National Park, but visitors no longer merely tolerate the town to get to the park. With its new landscape improvements attracting people, visitor surveys reported people stopping and staying in Estes Park instead of just passing through (Sorvig 36). The town itself is now a destination. Don Brande’s, ASLA, Design Studio West’s President, states, “Whatever you’re contemplating... do it for the residents. They’ll invite relatives and friends; visitation will grow.” (40)

The redevelopment of Coffee Creek mirrors this idea— becoming a destination of its own, as well as acting as the gateway to the Dunes. Sorvig relates this to the concept “amenity migration”, creating places that people want to live in and relying on the value of place to attract new residents, appropriate businesses, and visitors,



figure 1.3 - Estes Park Riverwalk, Colorado

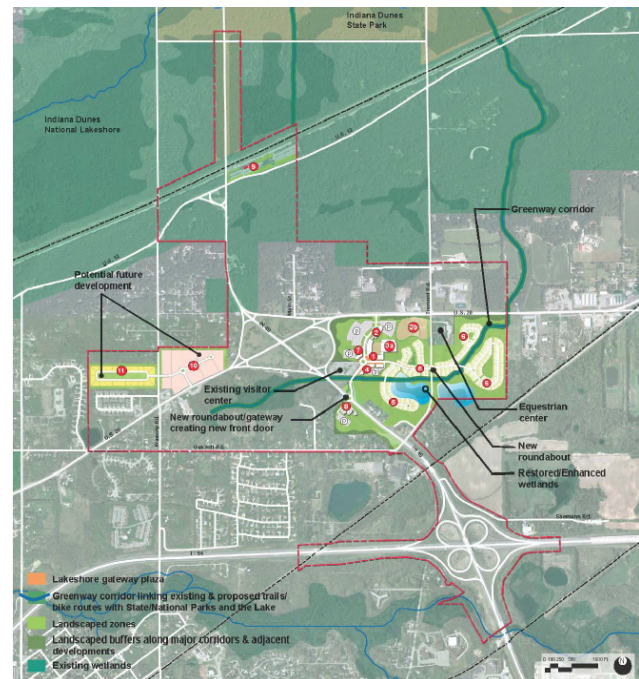


figure 1.4 - Gateway to the Dunes Project, Porter, IN

demonstrating the value of place and placemaking. Amenity-based economies are generating more income than other industries. (Sorvig 40-41) These types of economies are based on the “inherent and holistic qualities of landscapes” (Sorvig 40). These qualities coincide with many of the concepts of Walkable Cities and New Urbanism. The landscapes created can either contribute to amenity-based economies or fall into crisis because they are based on removable resources, such as commercial chain businesses (Sorvig 40). As earlier mentioned, the Indiana Dunes State Park is the town’s main amenity. Banking on this type of opportunity greatly advances Chesterton’s current economic revitalization. Making Coffee Creek a destination not only helped the town economically but it became a landmark for Chesterton and a gateway to the Dunes as well.

To further support this connection to the Dunes is the “Gateway to the Dunes Project” in the town of Porter, Indiana, located just north of Chesterton (see figure 1.4). The project creates an upgraded corridor from Interstate 94 going north along Indiana 49 into Indiana Dunes State Park, including stylized architectural elements and a 10 foot-wide Dunes Kankakee Trail hike/bike path separated from vehicular traffic by a barrier wall. Mark Lopez, representing U.S. Rep. Pete Visclosky, says, “The Gateway is about jobs: from engineering/design through construction creating places for tourists to eat, sleep and visit, prompting some of them to move here and more businesses to locate here to serve them” (Poparad). The exact route of the future Dunes Kankakee Trail has not been finalized, however, it is known that it will stretch the length of Porter County and end at the Kankakee River. The trail would enter Chesterton’s jurisdiction at one point, a chance for the town to make contact with users.

Chesterton Councilman Jim Ton stated, “It’s obviously in our best interest to get (trail users) downtown” (Poparad). A key element of the Gateway Project is economic development. Although initial development is occurring in Porter, Chesterton is a viable site for expansion on this project. The redevelopment of Coffee Creek as a resort community ties into this network of trails and further expands on the Gateway to the Dunes. Considering there is already infrastructure in place at Coffee Creek created a better argument to implement some of the Gateway features here as well. Bringing the Gateway Project into Chesterton boosts its economy, just as it will do for Porter.

Several lessons were learned from the failure of Coffee Creek Center. The most important were to not ignore the surrounding context and don’t forget the client for whom you are working. Coffee Creek designers seemed to ignore the fact that Chesterton was already a small town efficiently housing Chicagoland commuters and fighting sprawl. A mall was even proposed to take the place of Coffee Creek Center in the immediate years after its downfall, but the residents effectively voted against it. They felt there was no need for a new commercial core, because there was already a walkable one right across the highway. Additionally, as mentioned earlier, the future clients of the new community were kept in mind, but the present clients, these residents of Chesterton, seemed to be ignored. Many residents felt that Coffee Creek was trying to replace Chesterton and therefore make the original town the “bad” part of town. Coffee Creek appeared to be turning its back on its context.

Hamin addresses what Coffee Creek developers

seemed to ignore – the community in which it wanted to be a vital part. This book, *Preserving and Enhancing Communities*, helps policy-makers, planners, and students of community planning effectively guide the growth and development of communities, following the fundamental policy of community preservation. This policy encourages local citizens to get involved in the planning process. Community preservation aims to preserve what is best about a community and encourage changes that enhance it. The book provides a range of current and best emerging practices for specific topic areas such as, preserving natural resources, enhancing community strengths, and redevelopment. It calls for community outreach, integration of all systems, and community structures to support one another, explaining how to identify community indicators. Every community is unique, therefore, indicators can help decision making in what is best for that area. This work was useful in developing a suitable redevelopment master plan for Coffee Creek. It helped identify additional indicators for what Chesterton needs. These guidelines helped the new design for Coffee Creek connect to and enhance Chesterton, Indiana, creating a landmark. The goal is to add to the town, not take away from it, to embrace it and the surrounding communities. The comprehensive plan of the town states the desired future physical growth of the community, covering all major aspects of a community's growth, change and redevelopment (Hamin 55). As discussed, Chesterton connected to the Gateway of the Dunes Project. It currently is the gateway community to the Dunes. The redevelopment of Coffee Creek thus fulfills these future goals of Chesterton to have a stronger connection to the Dunes. The development of the site respects Chesterton's plans for their future. Also, historically, local planning didn't fully

address biodiversity and ecosystem protection. New increased public awareness has recognized that healthy ecosystems are integral to protecting human health and quality of life of a community (Hamin 101). The ecoresort community also respects conservation efforts of the site and the successful established watershed preserve, embracing the site's character and the Chesterton residents' desires for it to remain a natural place.

From examining the Gateway to the Dunes Project and the failure of the initial redevelopment of Coffee Creek, the new development suits the site in a more appropriate manner. Not only does it hit its target audience, locals and visitors alike, but it also contributes to the local economy and caters to people's interest in the Dunes. Chesterton already contains service amenities suitable for tourists. The new ecoresort community physically and symbolically links to Indiana Dunes State Park. It serves to educate tourists and residents about the importance of the Dunes and what they can do to help protect it. Visitor numbers continue to increase, supporting the resort community. Celebrating the relationship between the Dunes and Coffee Creek ties Chesterton to these unique environments, designating it as the gateway community to the Dunes.

The redevelopment of Coffee Creek better addresses it's surroundings and the people's interest. Expanding upon existing amenities and improving the site's amenities will greatly influence the economic revitalization of Chesterton. It will create a landmark for the town, establishing Chesterton as the gateway community to the Dunes.

ecotourism

Jost, ASLA, revisits the iconic Pelican Bay of Florida, designed by John Ormsbee Simonds, an avid environmentalist, in his article “Back from the Beach”. He covers the ground-breaking history of Pelican Bay and the lessons its environmental planning can offer designers today. In *Landscape Architecture* Simonds wrote, “It is fundamental to intelligent land and resource planning that the natural systems which protect our health and well being be understood and sustained.” (Slade) This philosophy is still seen in his work today. Pelican Bay, his most famous work, has been a model of environmental planning since the 1970s, designed with the environment first and foremost in mind (see figures 1.5 and 1.6).

Prior to this environmental movement, Florida was “going to pot” before Simonds’ eyes (Jost 74). Residential sprawl and environmental degradation was the result of limited laws that guided development after land had moved into private hands. However, during the beginning of Simonds’ career, a variety of environmental laws were going into effect, such as the creation of the Environmental Protection Agency (EPA) and the 1972 Clean Water Act, thus setting the stage for his design of Pelican Bay. The community is comprised of clustered development around recreational and preservation land. Being one of the first of its kind, it is still teaching designers lessons about preservation and conservation today. As an illustration, the primary goal of the development was to preserve as much of the native mangroves and native vegetation as possible. However, over time it became evident that the smaller the piece of nature that is conserved, the more likely it will be lost. Also, due to its uniqueness compared to surrounding communities and its history, Pelican Bay has developed



figure 1.5 - Pelican Bay



figure 1.6 - Pelican Bay community plan

into a destination community as well.

Parts of Pelican Bay are only accessible by residents, while the rest is open to the public (Jost 81). This balance of private and public access also revealed itself in Coffee Creek's redevelopment through site analysis. The interaction between Chesterton residents and visitors was taken into account through the design. Although some separation between the two has occurred, the residents are also an example of sustainability as well. These simple lessons about preservation and conservation started to shape the redevelopment of Coffee Creek. Careful consideration was taken into account about public versus private areas and the level of access throughout the existing and expanded watershed preserve. Similar to Pelican Bay, Coffee Creek's new amenities, through sound environmental planning, contribute to the resort community.

The World Tourism Organization studies numerous case studies of ecotourism destinations in *Sustainable Development of Ecotourism: A Compilation of Good Practices*. Several objectives and strategies were recognized when analyzing the case studies. Naturally, conservation was the prime motivation for the initiation for more than half the projects. Raising awareness in local communities about their natural and cultural resources was also of importance. Educational benefits were also explored. The local community and tourists would both learn about sustainability and conservation from these ecotourism destinations. How these principles were accomplished by the various destinations was revealed in the studies. Many of the cases had common site features. These included limited access to

sensitive areas, regulating distances to be maintained during animal observation, entrance points and reception facilities for controlling visitor flows, minimizing environmental impact by visitors by using facilities such as boardwalks and marked trails, etc. Other approaches involved environmental planning in land-use plans. (The World Tourism Organization 12) Education and interpretation features were recognized as an element of value, significantly enhancing tourist satisfaction. This was accomplished through information and visitors center, interpretive signage, self-guiding trails, guided tours, etc. (The World Tourism Organization 13) Two important results achieved by the various case studies were the reduction of pollution and rehabilitation and improvement of the ecosystems, as well as, an increased sense of ownership and responsibility for natural resources among the local communities (The World Tourism Organization 14). These design principles were utilized throughout Coffee Creek to minimize impact on the existing and expanded watershed preserve. Additionally, this study supported ecotourism as an effective educational tool and amenity for communities. Through ecotourism, Coffee Creek became a learning center informing visitors and local residents how to respect and care for the Dunes. Ecotourism supports ongoing conservation efforts, such as "Save the Dunes", as well as supports the watershed preserve at Coffee Creek.

The watershed preserve contributes to the resort community through ecotourism, aiming to protect ecologically sensitive areas and promote conservation. Ecotourism is, "Responsible travel to natural areas that conserves the environment and improves the well-being of local people" (The International Ecotourism

ecotourism: “responsible travel to natural areas that conserves the environment and improves the well-being of local people.” (The International Ecotourism Society) It creates/improves a “sense of place”.

destination elements:

- promote conservation
- education
- limited access to sensitive areas
- reception facilities
- information center
- interpretive signage
- boardwalks & marked trails

ecolodge guidelines:

1. conservation of surrounding flora & fauna
2. indigenous materials
3. water conservation
4. furthering education
5. minimal environmental impact

Society). It is about uniting conservation, communities, and sustainable travel. It expands upon other forms of sustainable tourism. Ecotourism adds to sustainability principles by building on a destination’s ‘sense of place’, building on environmental and cultural awareness and respect. (The International Ecotourism Society) It involves the community and informs both visitors and residents. With sustainable tourism, residents learn to deal with outsiders enjoying their home. However, with ecotourism, residents also discover their own heritage and what they have been taking for granted that visitors find interesting. Tourists get more out of their visit as Chesterton residents show off their pride in their community. Additionally, ecotourism benefits the local economy and supports the integrity of the place. Travelers will seek out businesses that emphasize the character of the locale, supporting the use of local services, products and supplies. Finally, “experiential’ tourism—which encompasses ecotourism, nature, heritage, cultural, and soft adventure tourism, as well as sub-sectors such as rural and community tourism—is among the sectors expected to grow most quickly over the next two decades.” (The International Ecotourism Society)

Chesterton residents have had a relatively long history with conservation and thus should have an immediate interest in the idea of ecotourism. Save the Dunes is one of Indiana’s oldest environmental groups (Save the Dunes). It was established by a group of concerned citizens in 1952 in efforts to create the Indiana Dunes National Lakeshore. The organization supports programs that enhance the relationship between nature and people within and beyond the National Park. The programs focus specifically on land, stewardship, water,

and education. (Save the Dunes) The mission of “Save the Dunes” “...is to preserve, protect and restore the Indiana Dunes and all natural resources in Northwest Indiana’s Lake Michigan Watershed for an enhanced quality of life.” (Save the Dunes) The efforts of the Save the Dunes Council and other contributors have preserved 15,000 acres of the sensitive Lake Michigan shoreline. There is a continuing concern, though, because “... beautiful and important Dunes, prairies and wetlands remain outside the parks, undefended. But even putting land into parks is not the final answer. New threats to the Dune’s ecosystem are always emerging...among them the often invisible villains of air and water pollution, toxic waste, landfills, and the filling and draining of wetlands.” (Save the Dunes) Coffee Creek is one of these outlying lands. Establishing ecotourism at this site begins the process of protection of its ecosystem and aides in spreading the knowledge of other such environments and what people can do to help in their protection.

The *Coffee Creek Watershed Management Plan* further supported the idea of utilizing ecotourism at the site. The watershed stakeholder’s vision is that “Coffee Creek supports a healthy cold water biological community and provides an attractive resource for citizens.” (Coffee Creek Watershed Conservancy 7) Enhancing Coffee Creek as an attractive resource is to additionally use it for educational purposes, particularly about sustainable stormwater methods. However, a series of concerns for the area were revealed through public meetings. One of these was the lack of public awareness about the value of Coffee Creek and how to protect it. Several goals and objectives were then outlined as solutions to this problem. An objective of educating about the value of Coffee Creek and ways

to protect its water quality and biodiversity included publicizing the value of the creek and ways to protect its water quality and aquatic life. This would be done by developing a list of best management practices, a biannual newsletter, and interactive website. Another possibility was to hold annual field days highlighting ways to protect Coffee Creek. This would emphasize water quality protection methods in agricultural and residential settings. (Coffee Creek Watershed Conservancy 58) The new community at Coffee Creek demonstrates these methods and becomes another ecotourism educational opportunity. Another goal was to complete the proposed project at Coffee Creek, presumably the existing watershed preserve within Coffee Creek Center. This project will have education components that aid in the aforementioned ideas to be publicized. (Coffee Creek Watershed Conservancy 59) As mentioned earlier, all of these are achieved through ecotourism and completed through the implementation of the ecoresort community design. Coffee Creek is the learning grounds about proper sustainable stormwater management. By exemplifying how to protect, treat, and heal Coffee Creek, these principles are in turn translated to the nearby Indiana Dunes State Park.

The International Ecotourism Society defines ecolodges as environmentally sound lodging facilities with conservation as a top priority. Such a facility enables visitors to interact with the natural and cultural surroundings of the region, promoting and furthering education. Innovative water, waste, and energy systems are used to lessen the impact of the facility on its surrounding environment (The International Ecotourism Society). Fennell also explores ecolodges and ecoresorts in *Ecotourism: An Introduction*. Ecoresorts

follow the philosophy and principles of ecotourism, minimizing environmental impact and educating about the environment of which it is a part of (Fennell 235). There is no generic style of an ecolodge. The main concern is that the facility is green (Fennell 238). An example of some unsustainable features of an ecolodge in Mexico included using materials not indigenous to the area (Fennell 240). With this information and ecotourism's principle of adding to an area's "sense of place", the facilities for Coffee Creek are designed with local materials and vernacular architecture, blending with its surroundings. A range of accommodation types cater to the variety of tourist types that visit Coffee Creek. Accommodations range from non-permanent types of dwelling such as tents to fixed-roof units, such as cabins and inns. According to Fennell, tourists such as school groups or scientific groups are willing to endure harsher site conditions while others stay in a variety of accommodation types (57). Coffee Creek attracts local school groups and residents, as well as out-of-state visitors and even international. Providing a variety of accommodations serves as many expected different groups of visitors as possible.

Based on guiding principles of ecotourism, such as minimizing impact and protecting a place's character, environmental planning for Coffee Creek comes into effect too. Like the mangroves of Pelican Bay, the Coffee Creek Watershed Preserve is incorporated into the design of the resort community as protected land. It serves to educate visitors about the natural sensitivity of the ecosystems of the area. Through ecotourism, Coffee Creek serves as an introduction to the Dunes and exemplifies how to protect these lands. Locating the new ecoresort community in Chesterton at Coffee Creek

respects and expands upon ongoing conservationists' efforts to "Save the Dunes". Promoting Coffee Creek as a rehabilitated landscape also serves as an environmental example for those about to visit the Dunes.



figure 1.7 - Beyond the Beach Discovery Trail

The Beyond the Beach Discovery Trail provides a guide to more than 50 sites that showcase the region's greatest natural and cultural amenities and attractions. It allows you to set your own route to the attractions. (Beyond the Beach Discovery Trail) Coffee Creek Watershed Preserve is one of these many attractions. This discovery trail has elements that tie into ecotourism, providing another support for its implementation.

stormwater management

With a watershed preserve already established in Coffee Creek, proper stormwater management is a key contributor to the design of the ecoresort community. Sustainable stormwater management was integrated into the original design of Coffee Creek Center. Making sustainable stormwater management methods artful expands on these initial concepts. Echols and Pennypacker study the use of “artful rainwater design” (ARD) to create amenities that enhance the beauty and value of a site. ARD exposes stormwater management to the public, helping educate them on how stormwater affects the quality of the environment. Five amenity goals were recognized after analysis of case studies - education, recreation, safety, public relations, and aesthetic richness. When all these goals are met, a powerful design is the result. (Echols 272) Design techniques to achieve these goals are also given and are useful for a variety of site types. Because ARD is an amenity that adds value, it proves to be a useful tool in implementing stormwater management into the redevelopment of Coffee Creek Center.

As for the public relations aspect of artful rainwater design, it demonstrates to visitors and residents that “we care” by creating symbolic stormwater statements about the values and qualities of those who created and own the site (Echols 280). This orchestrates to visitors the value of water and ties into the principles of ecotourism. ARD is used as an educational tool, and teaches visitors and residents about sustainable water resource practices, educating all about the process of stormwater management methods and displaying how it directly affects Coffee Creek. Additionally, the water of Coffee Creek eventually reaches Lake Michigan, so

ARD helps to further emphasize the connection to Indiana Dunes State Park by revealing relationships among ecosystems that most people are unaware of. Visitors realize the direct correlation between the two sites and are able to experience first-hand the connectivity that water creates. Design techniques such as visible water trails, rich landscape narratives, and signage reveal the learning experience (Echols 274). Making the system visible encourages visitors to notice it or piece together the puzzle to understand how the stormwater management system works (Echols 274). Also, ARD addresses recreation in the sense of interactivity. One strategy to achieve this connection/interaction is through recreational paths, allowing people to actually enter the stormwater management systems. These are strategically placed to ensure that features are noticed. They can connect off-site destinations through on-site paths. Interaction, education, visibility, and interpretation are key elements for successful ARD. (Echols 276) As earlier mentioned, Coffee Creek uses this idea to relate back to the Dunes, further strengthening the sites’ connection and supporting the site as a whole as a gateway.

Ferguson discusses all aspects of stormwater management in his book, *Introduction to Stormwater*. The book provides an understanding of the relationship of stormwater to the human and natural environment and covers a range of available management approaches and basic quantitative methods to estimate and design for stormwater. Ferguson takes a look at stormwater and the human experience. He explains that stormwater management is influenced by and influences every detail of a site. It begins with an understanding of place. To make the living community whole, the forms and

processes of human and natural ecology of a place need to be made apparent to make the land whole. ARD is used to make these processes apparent to community members and tourists alike. The distinguishing characteristics of a place identify it, making people aware of it and its meaning. “People anchor themselves in their bioregions when they read the course of water through their communities” (Ferguson 13). A survey of residents along a Michigan creek, for example, found that although the creek was lacking in aesthetic value, it was appreciated for its “thereness”. They expressed concern for their “nature amenity” and its future even though it was in good condition. (Ferguson 14) On the contrary, another study showed that where stormwater management was seen as purely technical in its function, local residents found it hazardous and unappealing and had no motivation to learn about it or take care of it (Ferguson 14). This observation further supported the function that ARD has in the redevelopment of Coffee Creek. ARD educates residents and visitors about the functions of the stormwater amenities and their purpose in protecting and improving the ecology of the watershed preserve. It again shows the connection between the people and the land and exemplifies the direct effect that stormwater can have on the natural environment. Ferguson states, “Wherever we go, we should be conscious of the careful return of rainfall to the soil.” (20) Trails paralleling swales or streams or placing stormwater basins centrally or integrally within a community makes them visible and accessible, creating meaningful amenities (Ferguson 22).

artful rainwater design (ARD):
stormwater management
implemented as an art form in the
landscape, celebrating sustainable
stormwater management.

*artful rainwater design elements/
guidelines:*

*wherever you go, be conscious of
rainwater returning to soil (Ferguson)*

make systems visible

interactivity

water trails

rich landscape narratives

interpretive signage

Maplewood, Minnesota, demonstrates sustainable stormwater management at a community scale and accepts the challenge of encouraging community involvement and pride (Sipes 30). It is located about 10 miles northeast of downtown St. Paul. Rain gardens are used to manage stormwater. Birmingham Street has become a successful case study in the town, igniting the movement for the entire city. The scale at which this idea was accomplished is what sets it apart from the rest. However, some fallback has occurred. Many gardens are in the right place, but are not designed well: getting landscape architects involved, thought, will rejuvenate the program (Sipes 39). This community provides insight and guidelines on how to get residents involved and accepting of this “new” idea. For example, residents choose their garden design and the city installs it. After installation, the resident is responsible for its maintenance, adding pride and attachment to the garden. Because of their noticeable presence throughout the community, the rain gardens are seen simply as part of the cityscape (see figure 1.8). This transformation has made sustainable stormwater management a part of their community’s culture. (Sipes 39) This is important to Coffee Creek as well. Ecotourism educates residents about sustainable stormwater management and the role they personally play in it. This education helps avoid problems that Maplewood faced where rain gardens were not properly designed and maintained. Giving the residents this knowledge through the ecoresort and artful rainwater design sets the stage for them to properly manage their piece of the puzzle. A principle of ecotourism is for residents to rediscover what makes their place unique. Landscapes develop over time. Having the community participate in this process personalizes the environment, completing its meaning

to the people (Ferguson 13). This creates that “sense of place” that is needed for the ecoresort community. Artful rainwater design also immerses residents in the process of sustainable stormwater management. Having the community base itself around sustainable stormwater practices distinguishes it from other communities. In addition to this, ecotourism establishes it as a sustainable destination.



figure 1.8 - Maplewood, MN, private rain garden

Issues with stormwater runoff stems back to impervious surfaces (Ferguson 3). Impervious surfaces prevent the natural absorbing, storing, and balancing cycles from operating. Groundwater aquifers are not recharged and pollutants in runoff enter into streams without treatment. Floods and erosion are also results of this. Approximately 70% of water pollution in the United States comes from non-point source pollution (Ferguson 7). A given population can reduce its need for pavements by reducing its dependence on vehicles. This can be accomplished through LID or clustered development. This type of development concentrates a given quantity of land use on only a portion of available land by using reduced lot sizes, reduced street lengths, reduced set-backs, and the sharing of driveways and parking bays (Ferguson 16). Although this concept initially failed at Coffee Creek Center to begin with, ecotourism attracts the target market that is meant for this type of living conditions. Wherever possible, then, permeable materials are also used to help reduce runoff. Existing infrastructure at Coffee Creek already uses permeable pavers for roads and walks. Over the years these have held up and therefore it is assumed that they will continue to do so.

Ferguson discusses the advantages and disadvantages of the different methods of stormwater management. Conveyance involves moving excess water to avoid flooding. Detention, similar to conveyance, slows down surface flows as they move away. However, detention alone is unable to address water quality, groundwater replenishment, or water supplies. Other methods need to be considered along with these to properly address stormwater runoff. Ponds or wetlands are examples of extended detention, utilizing natural

filtering to improve water quality. However, extended detention has the inability to adequately address volume of runoff, groundwater or water conservation. On the other hand, infiltration involves water soaking into the ground. It addresses flooding, erosion, as well as water quality, groundwater, and water supplies. Infiltration happens in all vegetated swales and porous soils to a degree. Therefore, it is the most complete solution to stormwater issues in the environment. As another solution to this issue, bioswales are particularly designed to improve water quality. Also, water harvesting is the direct capturing and using of runoff on-site, helping to maintain water levels in permanent ponds and wetlands too. Permanent pools are essential for wildlife, aesthetics, recreation, and water quality enhancement. (Ferguson 40-44)

The *Coffee Creek Watershed Management Plan* discusses water quality issues throughout the watershed. Public meeting participants identified several concerns about water quality within the watershed. These included non-point sources and habitat issues. Throughout the watershed there is increased runoff, sedimentation/erosion, and loss of habitat. Agriculture in the watershed means that the infiltration and filtering capacity of the landscape is almost completely eliminated and more pollutants are discharged into the aquatic systems (Coffee Creek Watershed Conservancy 19). Wetland loss and an increase of impervious surfaces have added to the increased volume of water entering the streams within the watershed. Because of wetland loss, there is a need for detention basins and reconstructed wetlands. Based on this knowledge and the information provided by Ferguson, it is clear that stormwater methods that involve infiltration and detention are best

suited for the site. These are in the form of wetlands, ponds, rain gardens, and possibly bioswales.

Wetland Design by France provides guidelines for wetland design on a local, site-specific scale. Wetland mitigation is compensating for wetland loss by their replacement elsewhere. The failure of most of these types of projects is due to inadequate design, bad site selection, absence of long-term maintenance plans, and lack of knowledge of the role of wetlands in the watershed. Knowing the type of wetland that was lost is most important towards the success of mitigation projects. (France 16) The *Coffee Creek Watershed Management Plan* provides insight as to what types of wetlands are found or were lost in the watershed. The theme of Coffee Creek's redevelopment is sustainable stormwater management. Therefore, treatment wetlands are constructed. According to France, these wetlands adapt well and are flexible to diverse landscapes and site conditions and are aesthetically attractive (16). Wetlands prove to be successful at Coffee Creek by providing passive recreation opportunities, education, and research amenities (France 22). This fits into the amenity goals of artful rainwater design as well as the principles of ecotourism, thus supporting the ecoresort community at Coffee Creek.

Rain Gardens by Andy Clayden and Nigel Dunnett, discusses similar ideas as Ferguson, however, actual design and implementation is covered in more detail. The authors define the term "rain gardens" as all possible elements that can be used to capture, channel, divert and "make the most" of rain that falls on a property (Clayden 13). They state that the most effective wildlife-friendly landscapes are mosaics of habitats.

Variety is key. Ponds are the most straightforward to create because they quickly colonize, resulting in rich habitats. The creation of these at Coffee Creek start to heal the wetland loss that the watershed has experienced over time. Using native plants support local wildlife as well as promote a sense of place (Clayden 38). Rain gardens are also good for play. Studies show that the most important qualities to children were sand/dirt, small shallow ponds, or moving water (Clayden 19). ARD design principles encompass this. Clayden and Dunnett suggest designing a stormwater chain, integrating different sustainable methods of stormwater management. The chain usually begins at the house, encouraging ownership and integration into the larger linkages, connecting everyone and everything (Clayden 46). The community members and tourists at Coffee Creek are a part of this chain, connecting them to one another and to the natural environment they are a part of. Like Maplewood, rain gardens and other sustainable stormwater management systems are integrated as simply part of the community design and streetscape, making it part of Coffee Creek community's culture.



figure 1.9 - ARD, Waterworks Garden



figure 1.10 - ARD, Pierce County Environmental



figure 1.11 - ARD, Cedar River Education Center

"The ecology of Northwest Indiana has long been one of the region's richest and at times most underrated asset."

- Lake Erie Land Company



the problem



significance

Chesterton is currently going through an economic revitalization. This involves the greening of the town and improvements to its role as the Gateway to the Indiana Dunes. Porter, the town directly north of Chesterton, has recently accepted plans to develop part of the Gateway to the Dunes. Chesterton would greatly benefit by expanding on this plan (Poparad). Because of Chesterton's location and commercial development along Highway 49, which leads straight to the Dunes, it is usually a last stop for visitors before they make their way into the Indiana Dunes State Park. Developing an ecoresort community at Coffee Creek fully establishes Chesterton as a gateway community. This flow of new visitors and residents into the new ecoresort community helps boost Chesterton's economy and revitalizes the town overall. Coffee Creek becomes a destination in itself, but it is also a gateway into the Indiana Dunes State Park. Being part of this Gateway to the Dunes, there is ample opportunity for the ecoresort community to be developed here.

Ecotourism is defined as, "Responsible travel to natural areas that conserves the environment and improves the well-being of local people" (The International Ecotourism Society). Chesterton residents have had a relatively long history with conservation, especially pertaining to the Dunes. Therefore, there should be an immediate interest in the idea of ecotourism. Save the Dunes is one of Indiana's oldest environmental groups, providing programs that focus on land, stewardship, water, and education (Save the Dunes). It acknowledges that many threats to the Dune's ecosystem occur outside of the park. However,

Coffee Creek becomes a beneficial outlying land through ecotourism.

Water is affected by and affects everything. For instance, when it rains after a farmer fertilizes his fields, the fertilizer is washed away by runoff into a neighboring stream. This water is then contaminated, harming the ecosystem through which it flows. Practices involving poor use of water have led to a decline in the amount of our general water resources as well. In contrast, on a smaller scale, Coffee Creek Community in Chesterton, Indiana, was poised to be redeveloped as a model of sustainable water practices. Unfortunately, due to monetary and illegal issues, the initial master plan was never realized. Few, other than residents of Chesterton and neighboring towns, know this. Currently, Coffee Creek is a small network of trails with sparse development throughout. The enhanced natural beauty of the existing site draws people in daily; however, there is need for expansion of these natural areas. Developing a new master plan that focuses on nature and stormwater management boosts its reputation again, making Coffee Creek a landmark for the town of Chesterton as the Gateway to the Dunes.

problem statement

This research explored methods for incorporating artful and sustainable stormwater management into the existing and proposed components of Coffee Creek Center in Chesterton, Indiana. Furthermore, this project determined how a watershed preserve is incorporated into the design of an ecoresort community. An analysis of the above findings lead to the redevelopment of the master plan of Coffee Creek Center utilizing stormwater management in its design, creating a landmark for the town of Chesterton.

subproblems

- 01 What types of opportunities are there for the redevelopment of Coffee Creek that will best suit development of this area, creating a landmark for the town of Chesterton?
- 02 How can a watershed preserve contribute to the design of a resort community?
- 03 How can artful stormwater management be integrated into the design of an ecoresort community such as Coffee Creek community?

“Chesterton will
preserve and enhance
the duneland
environment.”

-Town Comprehensive
Plan 2010



design program

vision

The mission of this project is to create an ecoresort community for the town of Chesterton, Indiana. This ecoresort community will utilize artful sustainable stormwater management as an educational tool to demonstrate to visitors and locals sustainable stormwater management. Areas of interaction with the stormwater systems will form an integral part of the design. Additionally, linkages between ecosystems throughout the watershed that Coffee Creek is a part of will be explored through artful stormwater management as well. Principles of ecotourism will guide design and program of the site as well, teaching people how to live sustainably and make minimal impact on the natural environment they visit. The new resort community will reflect sustainable efforts made in Indiana Dunes State Park and serve as a model to this. The new community and ecoresort will help establish Chesterton as the gateway community into the Dunes.

goals & objectives

01 Create an ecoresort community

- Create a permanent residential community using LID/clustered development
- Design an ecolodge
- Provide sustainable, nature-based recreation and activity

02 Establish Chesterton as a gateway community to Indiana Dunes State Park

- Connect Coffee Creek to the Gateway to the Dunes project and to Indiana Dunes State Park by providing a trailhead to the Dunes Kankakee Trail
- Provide a learning center that provides information on both Coffee Creek and the Indiana Dunes
- Use design elements that reflect the Indiana Dunes as a theme throughout the site

03 Educate visitors and locals about sustainable stormwater management

- Utilize artful rainwater design as an educational demonstration tool.
- Implement programs such as guided tours to educate visitors about sustainable stormwater management
- Design interpretive trails throughout the site

users

- Visitors
- Residents (local and community)
- Students

The ecolodge itself, it geared to accommodate visitors that are interested in a more natural and sustainable experience to add to their experience at the Dunes as a whole. Other accommodation types are also geared towards housing students. Educational areas serve all users and clients.

The learning center serves both visitors and residents. It educates all about the importance of Coffee Creek, the Indiana Dunes, and sustainable stormwater management. It will provide the hub for environmental education.

The residential community houses those willing to participate in a sustainable way of living. The community is designed to maximize sustainable stormwater management methods. It educates both residents and visitors how to one can make a positive environmental impact at their own home.

criteria

- Connect to the Indiana Dunes through theme, conservation, and physical connections
- Integrate ecology, recreation, and the built environment
- Architecture and infrastructure should embrace, reflect, and celebrate the surrounding landscape
- Make minimal environmental impact
- Improve habitat/environment
- Resort amenities provide for residents and visitors
- Design is environmentally sustainable and sensitive
 - On-site wastewater treatment
 - Water harvesting and conservation
 - Minimal impact
 - Focus on sustainable stormwater management education
- Native vegetation in all planting design
- Integration of sustainable stormwater management throughout community and preserve

design elements

Ecoresort

LID/clustered residential development

Environmental education center (learning center)

Habitat restoration

Re-established/constructed (treatment) wetlands

Artful rainwater design (ARD)

Interpretative educational features (signs)

Passive recreation

Wildlife viewing

Boardwalk/trail system

“Where ever you
go, be conscious
of rainwater
returning to the
soil.”

-Ferguson



design process



The guidelines for ecotourism and sustainable stormwater management that were discovered and formed from research guided the entire design process. These guidelines included minimal environmental impact, educational elements, and managing all rainwater and runoff on site.

It was important to connect to the context of the site, as well as, respect the site's existing ecological conditions, such as soils, land use, and topography.

The existing conditions greatly influenced development placement and type. Context revealed the needs of Chesterton's residents as well as important connections for a successful design. Indigenous materials and vernacular architecture were developed from the context and its history as well.

Context

The site is located in Chesterton, Indiana. It was originally designed to be Coffee Creek Center, a new urbanism community with environmental planning and ecological restoration as its backbone, hoping to serve commuters to Chicago. The original master plan was never realized.

The site is only 5 miles from the entrance to the Indiana Dunes State Park (see figure 4.2). It is located just south of the district's schools and Chesterton's historic downtown and central business district (CBD). Its close proximity to schools supports its educational value, while the historic downtown and CBD provide existing amenities for the resort and community. The "Gateway to the Dunes" project is located just north of this in the town of Porter. This gateway project creates an upgraded corridor into Indiana Dunes State Park. It includes places to eat, sleep, and visit. Also, part of the design is the Dunes Kankakee Trail, a hike and bike path along the Highway 49 corridor, which forms the western boundary of the site. Major vehicular circulation routes of visitors and locals run adjacent to the site, making it highly visible. Highway 49 provides a direct connection to the State Park. Critical watershed areas adjacent to the site revealed opportunities for major habitat restoration. (see figure 4.3)



figure 4.1

vicinity map

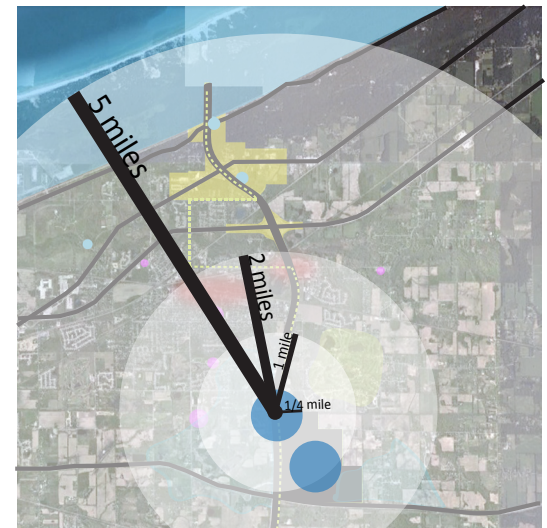


figure 4.2

distance

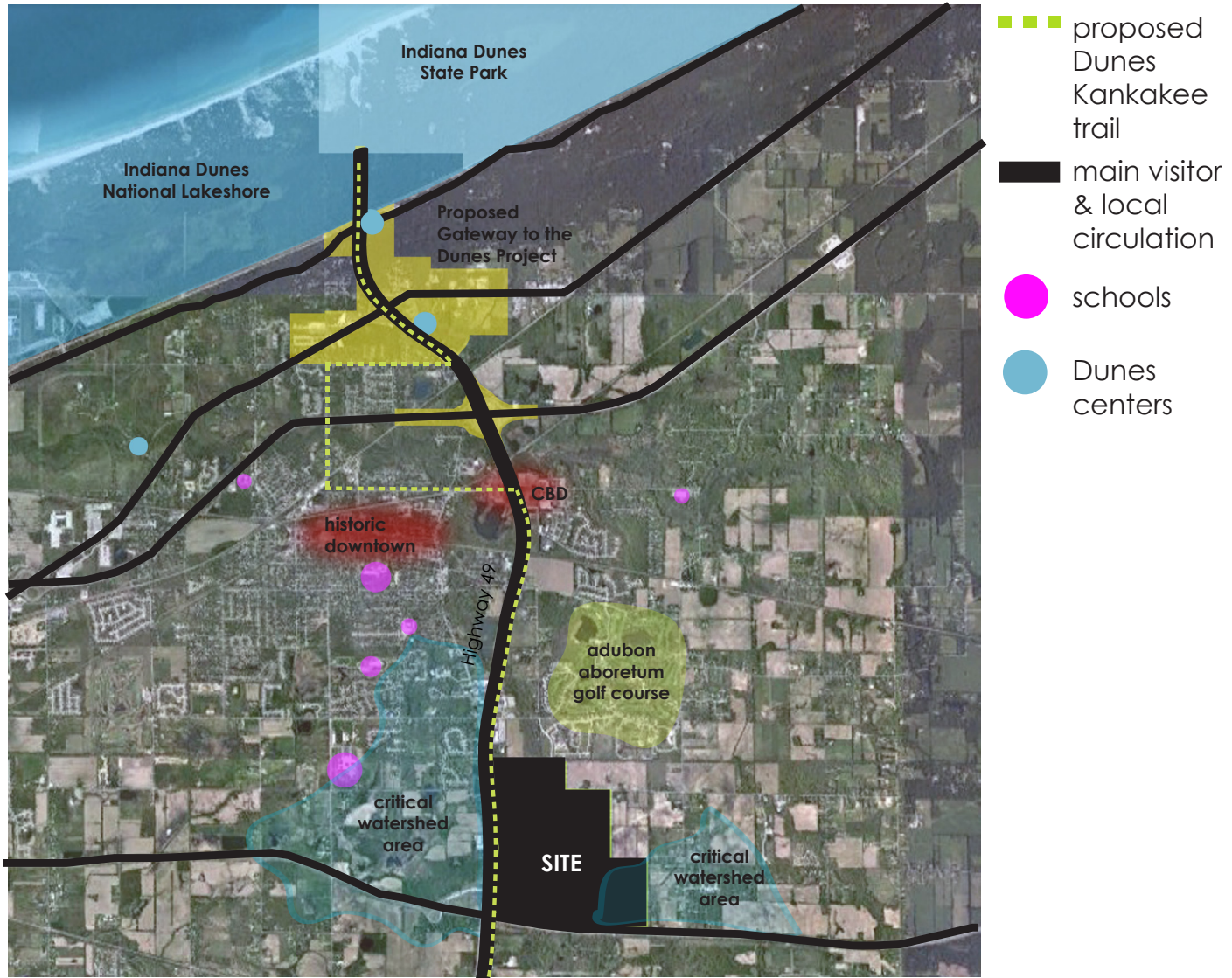


figure 4.3
site context



existing features

The site is 640 acres, 180 of which are the existing Coffee Creek Watershed Preserve. Today, the only remnants of the original design are sparse residential and commercial development and roads that lead to nowhere. The completed watershed preserve of the original Coffee Creek Center has been the only truly successful attraction so far.

Primary users of the site are people of all ages. Presently, it is largely used for passive recreation, such as hiking, biking, running, and fishing. The site is also a popular destination for wedding ceremonies and photo shoots. Additionally, the existing pavilion is used for town festivities, such as the town picnic. The site as is has environmental education potential. Random interpretive signage can also be found. However, it is often overlooked.

The existing water plaza is the most popular piece of the preserve. It provides seating/picnic areas and paths down to the water for children and adults to explore. People can interact directly with water cascades that flow into Philips Pond. This existing interaction with water systems provided opportunities for further educational purposes and artful rainwater design.



figure 4.4a
existing site

01



commercial strip

02



water plaza

03



boardwalks



residential



amphitheater



trails

figure 4.4b - existing features and conditions



land use

The site is a mosaic of habitats. Most important land uses are the deciduous forest and wetlands. These were highly respected and rehabilitated where needed. The forest was expanded upon to support existing wildlife inhabitants and encourage wildlife numbers to increase.

Wetlands are extremely important to the ecology of the site, the Dunes, and the bioregion in general. Within dunes habitats lie several types of wetlands (Our Land, Our Literature). Wetlands are numerous behind back dunes. The oldest dunes lie between the moraine and lake. Coffee Creek is found in this area. Most of the older dunes and their adjoining ecosystems (wetlands and forests) have been leveled for agriculture and industry (Our Land, Our Literature).

Therefore, it is extremely important to preserve and restore what we can of these forested and wetland areas. The design restores, protects, and celebrates these unique wetland habitats that are so important to the area. New development connects to the existing commercial and residential areas while avoiding the floodplain. This being said, the prairie and lawn areas established disturbance limits.

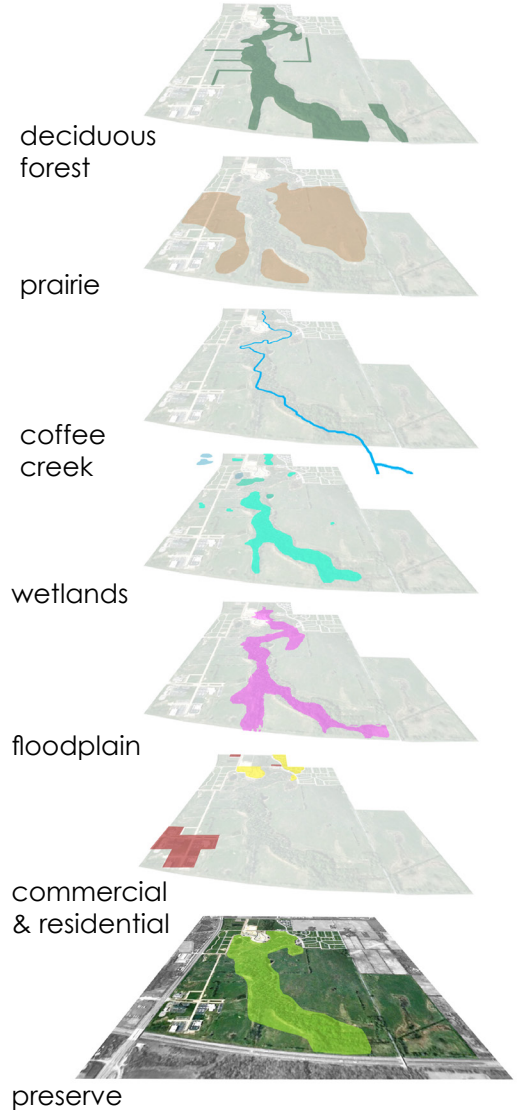


figure 4.5a - land use layers

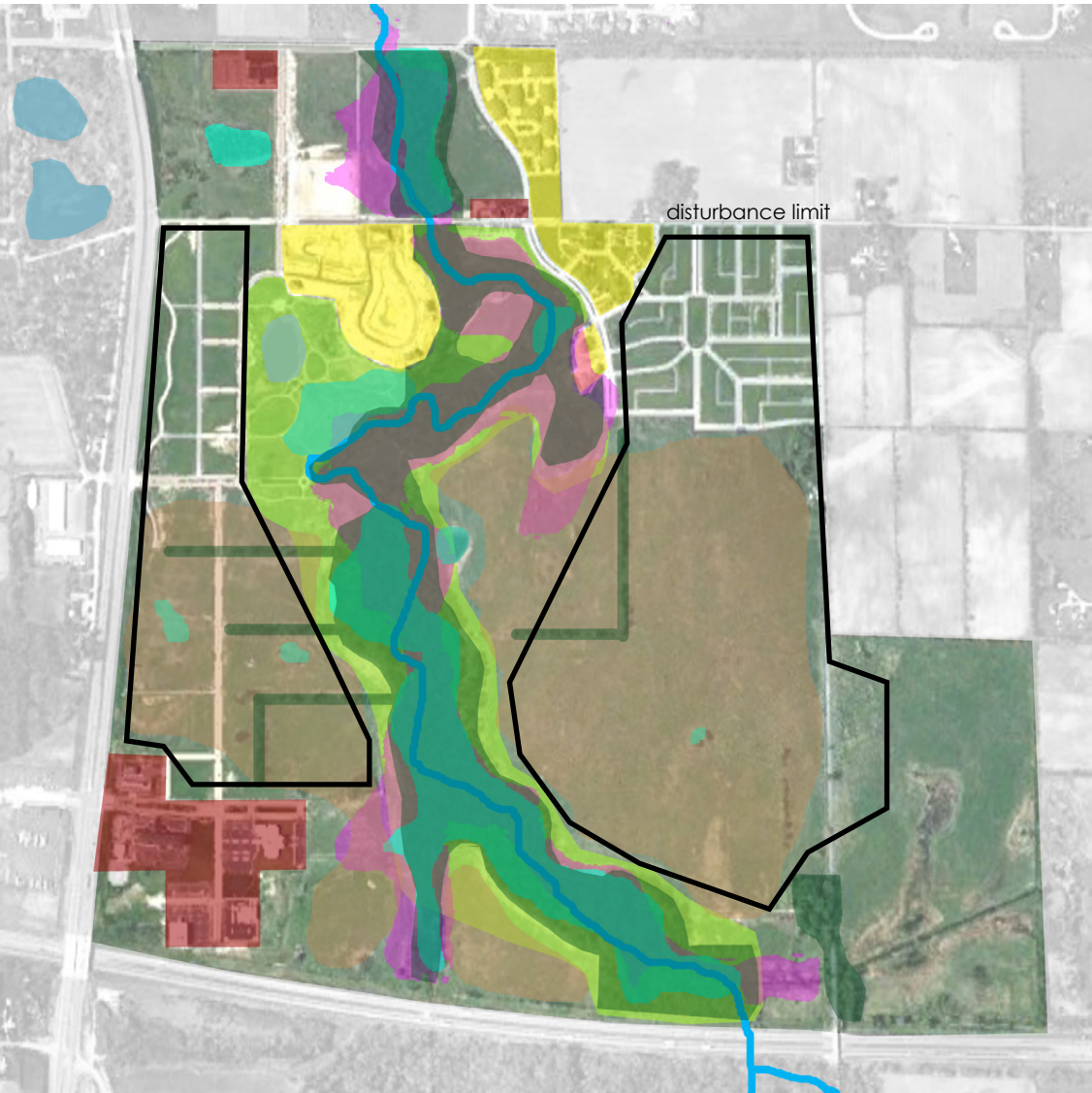


figure 4.5b - land use diagram



Soils

Soils were a major influence on design decisions. They were used to determine the most appropriate places for built features as well as wetlands. Well drained soils are best for building development because the chance of flooding is reduced. Additionally, Chesterton's Town Comprehensive Plan 2010 states that "soils with the poorest capability for development and drainage are co-located with wetlands and floodplains and should usually be incorporated into the town open space area." (20) This supports the decision to concentrate constructed and rehabilitated wetlands on these types of soils.

Therefore, wetlands should be constructed or re-established on poorly drained soils. Furthermore, these types of soils have a low percolation rate, thus, pollutants the constructed treatment wetlands are cleansing are less like to leak and contaminate aquifers. Low percolation rates also translate into better cleansing soils because it takes polluted runoff longer to travel to the aquifer, therefore spending more time getting filtered. Additionally, constructing wetlands on poorly drained soils is less expensive because a liner does not need to be used.

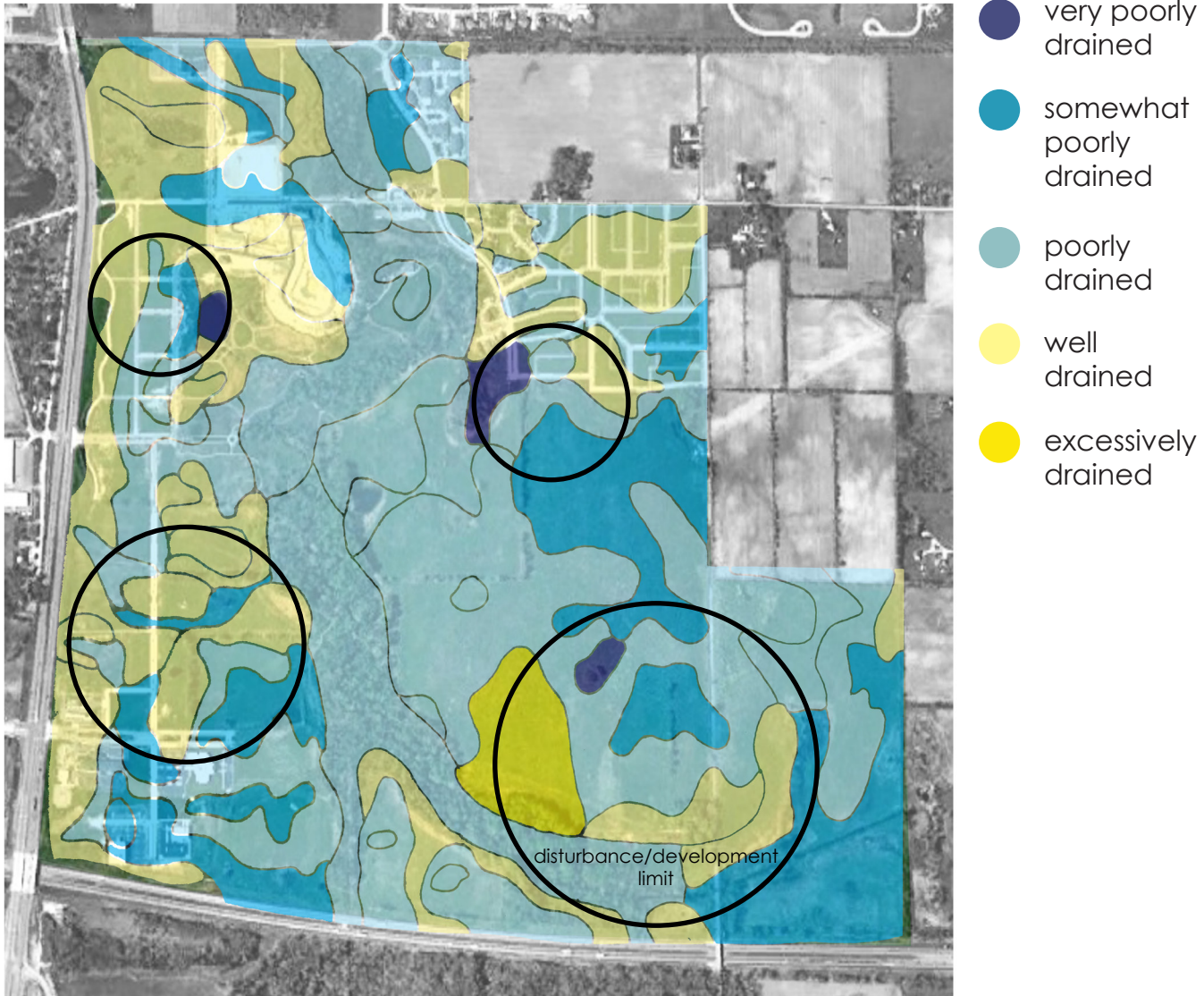


figure 4.6 - soils

topography

The site is relatively flat with some rolling hills (see figure 4.7a). These hills create high points that provide major view sheds. Highway 49 is higher than most of the site, making the site highly visible to passerbys. This opportunity was used when determining appropriate development areas and gateways into the site. One of ecotourism's design principles is respecting topography.

Therefore, the design respects topography, with major circulation infrastructure following the curves of topography. The design also utilized natural drainage ways, which helped determine major wetland placement.

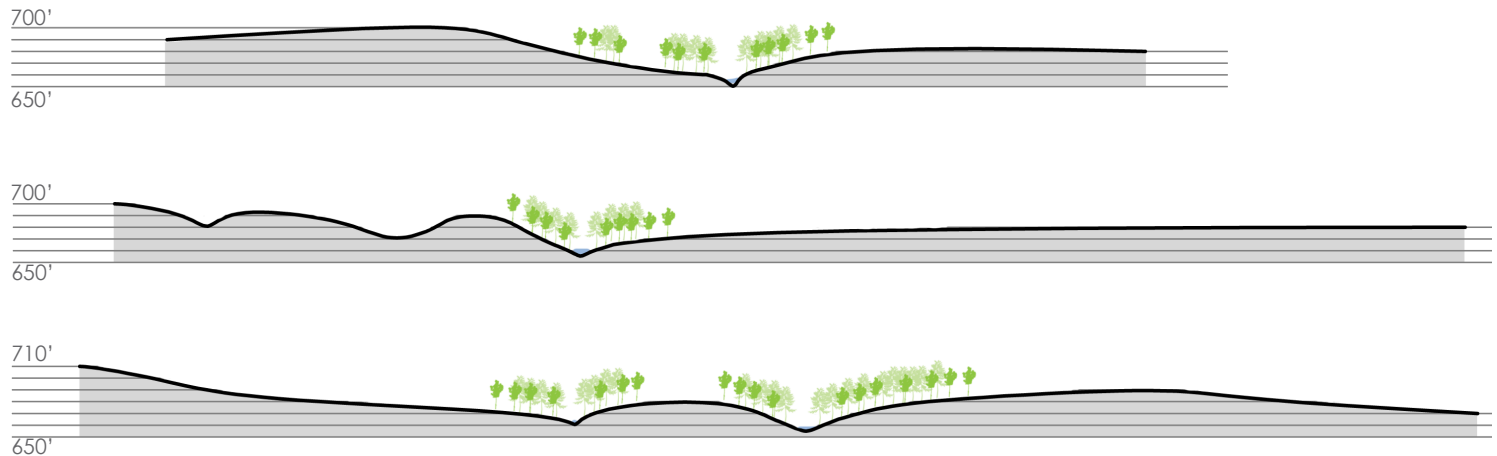


figure 4.7a - topography sections of entire site
(5X vertical exaggeration)

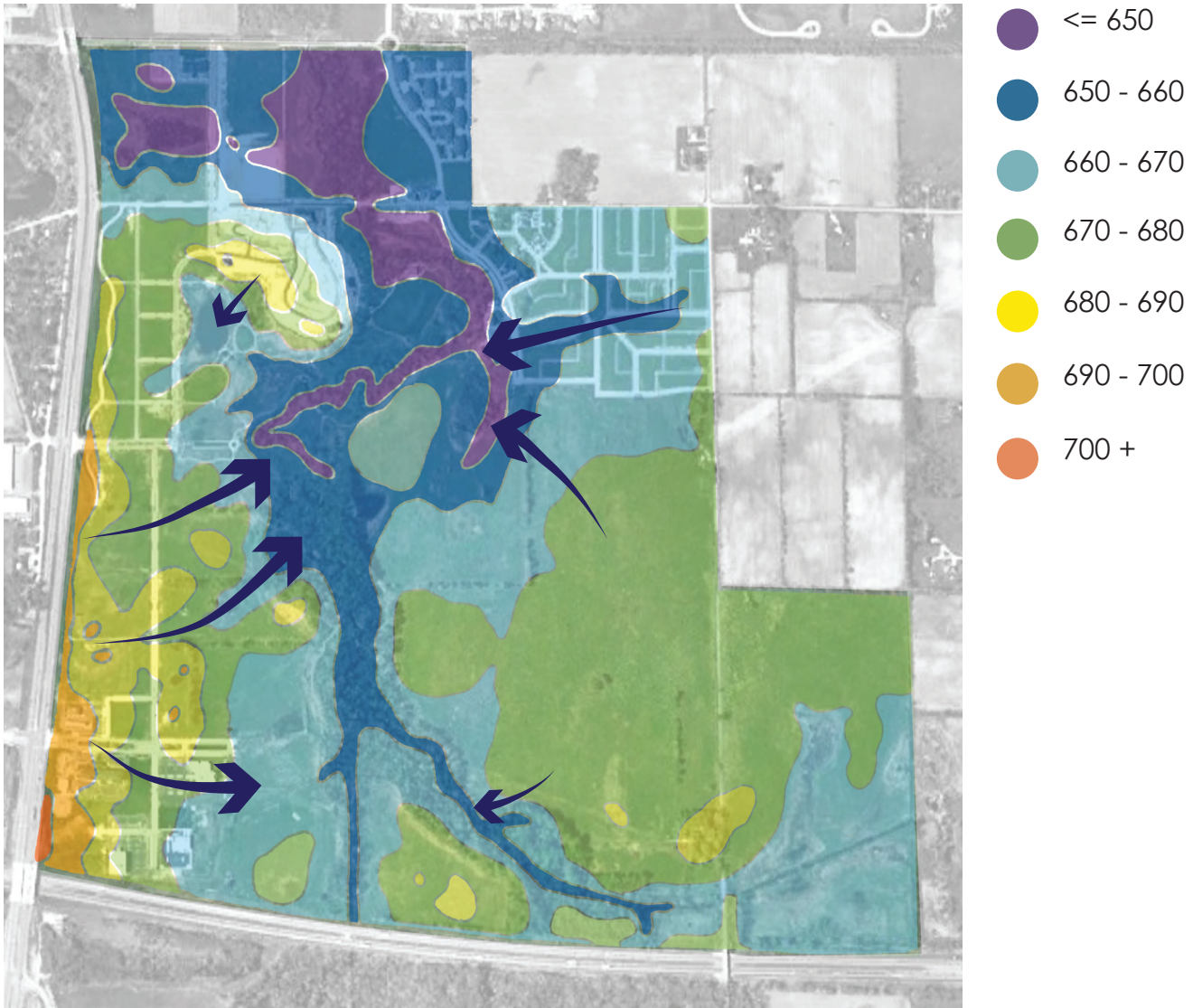


figure 4.7b - topography & major drainage ways



qualitative inventory

This revealed traffic volume in and around the site, which was used to determine gateways that would draw in the most people. Views into the site and from the forested area were also explored. These were uninterrupted as much as possible in the new master plan.

Habitat fragmentation and critical watershed areas were also revealed. These provided opportunities for habitat restoration. Critical watershed areas are defined as areas with water quality and habitat issues (Coffee Creek Watershed Management Plan 37). One of these areas is adjacent to the site, while the other overlaps the site. The overlapping critical watershed area provided a chance for a major sustainable stormwater management educational area on site. High activity areas were also connected to. Because they currently draw a lot of attention and activity on site, they were important areas to celebrate. Vegetative buffers help reduce noise and block unwanted views of the highway and toll road.

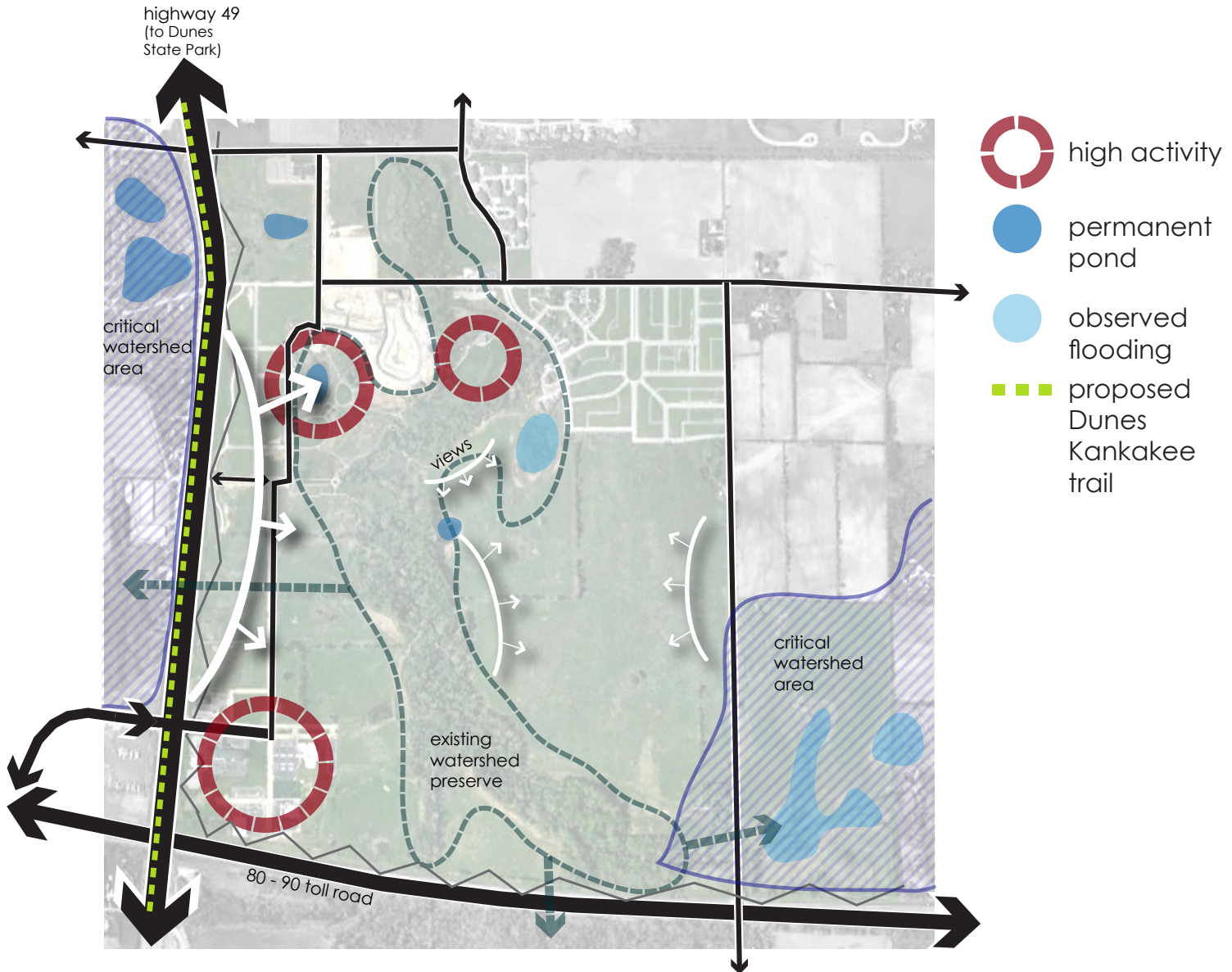


figure 4.8 - qualitative inventory

